Electronics Design

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Updated Status, Recent Changes

- **Review of things that have changed for Cal Electronics:**
  - **AFEE board design and layout being done at SLAC. NRL has parts, testing and verification responsibility.**
  - **PIN diode to AFEE connection implemented by twisted-pair wires instead of flex cable.**
  - **GCRC chip package is going to larger body plastic package, 14x14 mm instead of 12x12 mm.**

Updated Status, Flight Design

- **Present Flight Design Status**
  - Have been testing pre-pre EM X AFEE Board.
  - Pre EM Y AFEE board is near end of layout at SLAC.
  - Connector manufacturer being switched from Cristek to Microdot (formerly Nanonics) and Airborn. Will use some Cristek connectors for EM boards.
  - Fuse selection and some ceramic capacitor selection is still being made.
  - LVDS communication biasing currents are still to be chosen. Bias currents are set by resistors on the AFEE board.

Electronics Issues, AFEE

- **AFEE Issues**
  - **AFEE Grounding method still to be decided**
  - **AFEE Thermal design still to be verified, implemented and tested.**
  - **AFEE circuit board design is still to be checked to IPC and NASA standards.**
  - **AFEE circuit board design is still to be checked for bowing/warping considerations.**
  - **AFEE LVDS communication reliability is yet to be finalized.**
    - **May be seeing some on-board interference in the LVDS signals with the present pre-pre X AFEE board. Needs more testing.**
    - **Pre EM Y board layout is different enough from present AFEE board to give different performance in this regard.**

Electronic Issues, GCRC

- **GCRC ASIC Issues**
  - **Changing to different plastic package for the GCRC requires new test boards.**
    - GCRC vector testboard is yet to be redesigned and manufactured.
      - Still have noisy trigger outputs of GCRC on test board.
        - » Have tried a few possible solutions without success, but still have a few remaining possible solutions.
        - » Need to have a board design with quiet triggers prior to redoing the test board.
  - **Working on modified VHDL code for a GCRC ver 5 ASIC submission**
    - GCRC v4 will be used for EM calorimeter. Ver 5 could be used for flight.
    - Modifications in Ver 5 code:
      - 2 bit read/write code instead of 1 bit, as done for ACD and Tracker.
      - Implement Reset command, gives row addressable resets.
      - Digital filtering of reset line, less susceptible to line glitches.
      - Change trigger request to TEM as simple digital-sampled row trigger. Remove trigger de-glitching and inhibits.
      - Include hard wired readable GCRC version number.
        - » Gives confidence of which VHDL code is implemented.

Electronic Issues, GCFE

- **GCFE ASIC Issues**
  - **Have usable GCFEv7 for Cal EM.**
  - **Ver 8 GCFE design to be submitted.**
    - **Modifications in Ver 8:**
      - **Gate out inadvertent triggers during preamp reset interval.**
      - **Have programmable register bit to turn off automatic preamp reset.**
      - **Increase output buffer gain to increase linear range from 2+ volts to 2.5 volts.**
      - **Modify charge injection capacitor values to be able to test autoranging function.**
      - **Give x8 sample and hold more of an offset to take care of some chips having a low offset, in the non-linear region.**
  - **GCFEv7 Test results:**
    - **Linearity is good.**
    - **Noise is not too bad, on the order of the design goal of 2000 electrons.**
    - **Sampling stage appears to add noise.**
    - **There are some increased noise effects at lower temperatures.**
      - **PIN diode capacitance greatly reduces the problems.**
      - **Still investigating.**

Electronic Issues, Connections

- **PIN Diode Connections**
  - **PIN diode attachment changed from flex cable to twisted-pair wires.**
    - **Mechanical design changes to implement this are complete.**
    - **Testing with mockup has not started.**

- **TEM – Cal Connections**
  - **Plan to change flight connector manufacturer from Cristek to Microdot and Airborn.**
    - **Received shipment of 69 pin micro connector with mounting jackposts instead of jack screws.**
      - **Customer service on this problem was lousy.**
    - **Received shipment of 37 pin nano connectors with incorrect pinout.**
      - **Customer service on this from their quality assurance person was non-existent.**
  - **Will use a combination of connectors for the EM cal boards designated for software testing.**

Electronic Issues, Schedule

- **Schedule for assembled EM AFEE boards is slipping.**
  - **First draft completion of AFEE board layouts by SLAC have slipped.**
  - **Time between first draft and acceptance of AFEE board layout will cause more slip.**
  - **Do not have all EM board parts in hand.**